

## What is Physics?

math, distance and time, movement, direction, acceleration, experiments, gravity, kinematics, relativity

### Definition:

The fundamental physical laws of nature.


The study of matter and energy (changes in energy result from forces).

Theories are tested through experiments and observations.

Observations are quantified through measurement - compare something to a defined unit.

metric system, SI - Systeme Internationale d'Unités

quantity	SI Base unit	Derived units
mass, m	kilogram, kg	gram, g tonne, t
weight, $F_g$		Newton, $N = \text{kgm/s}^2$
displacement, s	metre, m	km, light year,
Volume, V	litre, l	1/1000 of a $\text{m}^3$ or $1000 \text{ cm}^3$
time, t	seconds, s	hours, ns, years, a
electric current, I	Amperes, A	

electric charge, Q		coulomb, C or elementary charge, e
intensity, I	candela, cd	W/m <sup>2</sup>
number of	mole, mol = $6.02 \times 10^{23}$ stuff	
Temperature, T	Kelvin, K	

Converting units:

multiply by a unit fraction and cancel the unwanted unit

eg. convert the distance to Hope, 200km into  
a) m b) nm c) light years

prefix	power
Peta, P	$10^{15}$
Tera, T	$10^{12}$
Giga, G	$10^9$
Mega, M	$10^6$
kilo, k	$10^3$
hecta, h	$10^2$
deca, D	10

unit	$10^0$
deci, d	$10^{-1}$
centi, c	$10^{-2}$
milli, m	$10^{-3}$
micro, $\mu$	$10^{-6}$
nano, n	$10^{-9}$
pico, p	$10^{-12}$
femto, f	$10^{-15}$

nucleus of the atom is about  $10^{-15}$  m

atomic radius is about  $10^{-10}$ m

red blood cell is about  $10^{-5}$ m

you are about  $10^0$  m

Earth is about  $10^7$  m

Earth - Sun is about  $10^{11}$ m

Closest star (after the sun) is about  $10^{16}$  m

size of the galaxy  $10^{20}$  m

size of universe  $10^{27}$  m

a)

$$200\text{km} (1000\text{m}/\text{km}) = 200\,000\text{m}$$

b)  $200\,000\text{m} (1\text{nm}/10^{-9}\text{m})$

$$2 \times 10^{14} \text{ nm}$$

c)  $d=vt = 3.00 \times 10^8\text{m/s} \times 1 \text{ year} (365.25 \text{ d/y})(24\text{h/d})$   
 $(60\text{min/h})(60\text{s/min})$

$$9.46 \times 10^{15}\text{m} = \text{light year}$$